

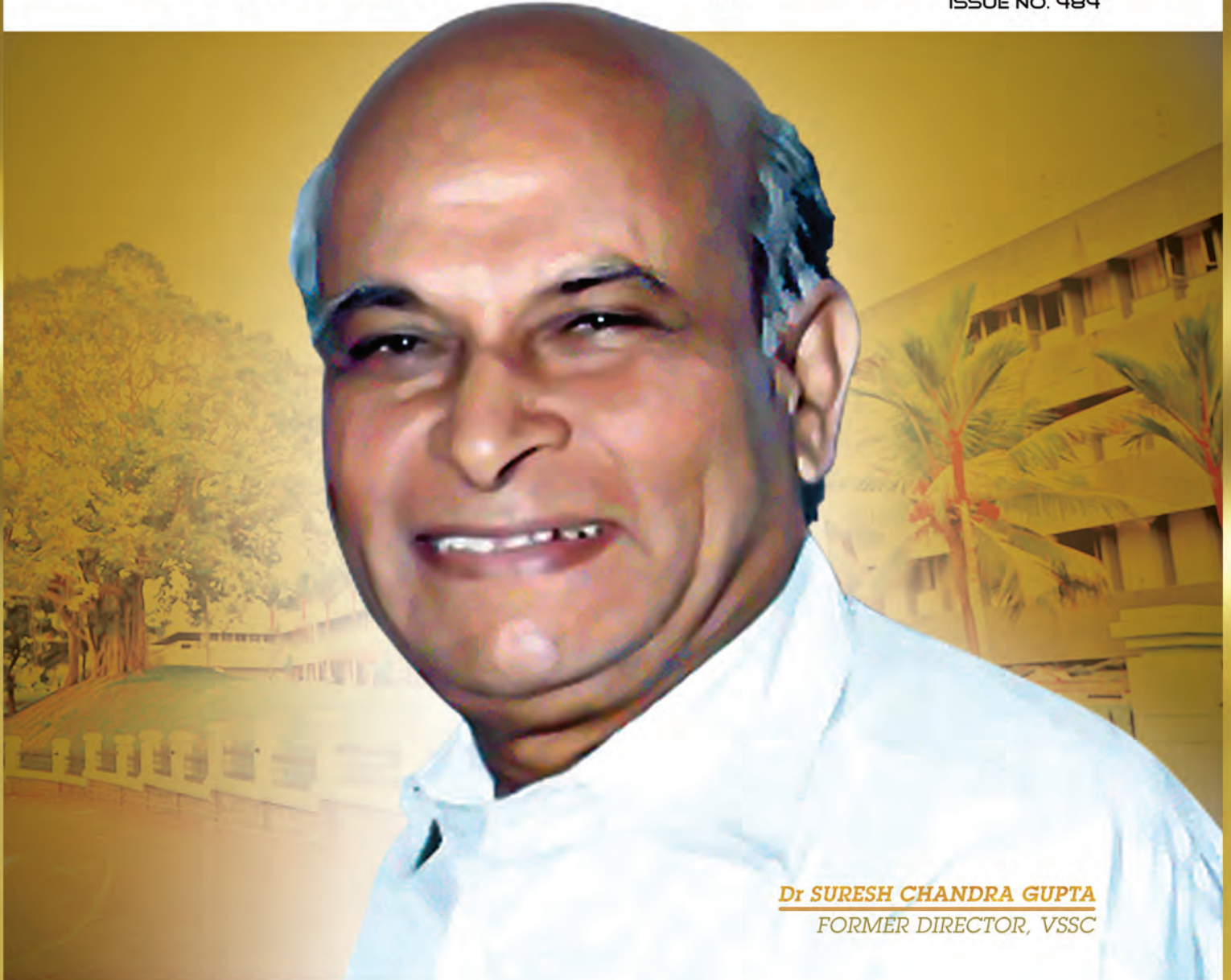


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Countdown

THE HOUSE JOURNAL OF VIKRAM SARABHAI SPACE CENTRE

AUGUST 2020 VOL 41
ISSUE NO. 484



Dr SURESH CHANDRA GUPTA
FORMER DIRECTOR, VSSC



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Dr SURESH CHANDRA GUPTA

(07.01.1934 - 09.08.2020)

A PROFILE

Dr Suresh Chandra Gupta was born on January 7, 1934. He studied at Banaras Hindu University and Indian Institute of Science, Bangalore and received his Doctorate in Engineering (Control & Instrumentation) from the University of Pennsylvania, Philadelphia, USA. Before returning to India in 1965 to join the Space programme, he worked in the USA both in the academic and industrial spheres.

On joining the Indian Space programme, he assisted Dr Vikram Sarabhai in planning and establishing the infrastructure for research and development in Space technology at Thiruvananthapuram. He is also responsible for the growth of the field of Control and Instrumentation for the Space programmes. He has held various positions such as Technical Co-ordinator, Rohini Group; Head, Control, Guidance & Instrumentation Division; Director, Avionics Group and Associate Director, VSSC. He took over as the Director of the Centre from November 30, 1985. He was elevated to the Distinguished Scientist level on January 1, 1987. He was made a member, Space Commission in March 1993. Dr Gupta has retired from the post of Director, VSSC in January 1994 and was subsequently designated Dr Brahm Prakash Distinguished Professor on March 1994.

Dr Gupta's work has made ISRO self-reliant in inertial sensors, inertial navigation systems for launch vehicles and allied sub-systems for satellites. His work has also resulted in indigenous competence in the design and development of onboard computers, launch vehicle auto pilots, hydraulic servo systems, strain gauge transducers and hardware-in-loop simulation. SLV-3, ASLV and PSLV have heavily relied on these instrumentation systems

and design & evaluation capabilities. As a spin-off, many of these have resulted in systems like reaction and momentum wheels, solar array drives, inertial reference systems and scanning mechanisms which found use in ISRO satellites.

Dr SC Gupta is an expert in the field of control and guidance systems for launch vehicles. One of his major contributions to the Space programmes is the multidisciplinary leadership role he played in the successful development of the satellite launch vehicle SLV 3. He also had a major role in transferring technologies developed by ISRO to industries and also in the utilization of the industrial infrastructure available in the country for Space programmes. Dr Gupta led the failure analysis of ASLV D2 and identified the systemic modifications needed. Implementation of the corrections led to the successful ASLV D3 flight. Formation of launch vehicle design norms based on ASLV experiences and implementation of the same in PSLV and GSLV were directed by him.

Dr Gupta has taken active interest in the development of Thiruvananthapuram as a Centre of excellence in science and technology. He has been a member of the Academic Council of University of Kerala, member, Board of Studies in Engineering and member of the think-tank envisaged by the State Government to industrialise Kerala. He supported close interaction between the College of Engineering Trivandrum and other academic institutions in and around Thiruvananthapuram through teaching of special courses by the staff of VSSC and by providing facilities for project work to the students. He was a member of Governing Councils of Electronics Research and

Development Centre, Regional Cancer Centre and Technopark at Thiruvananthapuram. He was also a member of the Kerala State Electronics Development Commission.

Dr Gupta is a recipient of the National Systems Award in 1975 for the outstanding contribution in the field of Systems and Control. He was awarded the 'Shri Hari Om Ashram Prerit Dr Vikram Sarabhai Research Award' for the year 1979 in the field of Systems Analysis and Management Problems. Dr Gupta is also a recipient of the SICO-NASI Award (sponsored by M/s SICO, Allahabad) of the National Academy of Sciences, India for the year 1989 for outstanding work in the field of instrumentation. He was bestowed with VASVIK Research award for Electrical Science and Technology for the year 1990.

Dr Gupta was the President of the Systems Society of India as well as Founder President of the Trivandrum Chapter of the Society. He was also a member of the International Programme Committee on Automatic Control in Space of the International Federation of Automatic Control (IFAC), member (Engineering Science) of International Academy of Astronautics, Paris and a Fellow of Indian National Academy of Engineering.

Even after his superannuation, Dr Gupta continued to interact with the scientific community of VSSC with his dynamic presence in the review committees especially the mission readiness reviews.

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Resolution

With heartfelt sorrow, we, the employees of Vikram Sarabhai Space Centre, Thiruvananthapuram condole the sad demise of Dr Suresh Chandra Gupta, former Director, VSSC.

Dr SC Gupta served as the Director of VSSC from 1985 to 1994. Dr SC Gupta was one of the pioneers handpicked by Dr Vikram Sarabhai in the initial years of Indian Space Programme and made outstanding contributions in development of avionics, control systems, inertial navigation systems and overall space system analysis, nurturing those fields from infancy to a laudable level of maturity and can rightly be termed as one of the chief architects of the Indian Space Programme. His contributions towards maturing of Launch Vehicle technology to the present level will be remembered by the generations of VSSC. His demise is definitely a great loss to the Indian Space Programme.

We sincerely wish that his family members are able to gather enough strength to bear with the loss.
May his soul rest in peace.

(S Somanath)



S Somanath
Director, VSSC

Legacies of Dr SC Gupta – a remembrance

Dr Suresh Chandra Gupta, the esteemed former Director of VSSC was a doyen in the key technological disciplines of Control, Guidance, Instrumentation, Simulation and Avionics. He was an impeccable character who led from the front during some troubled times of our Centre and nurtured us to an appropriate level of maturity from where we could confidently move forward with many exciting programmes for the benefit of our country.

Dr SC Gupta assumed the office of Director soon after I joined VSSC. Fresh from my college after graduation, I was packed with immense pride and great enthusiasm to join this esteemed organisation which was a dream for all engineering students of Kerala. I was assigned to the PSLV Project. The PSLV project was in its infancy and all the team members including me was engrossed with tasks of building the launch vehicle brick by brick and we embarked on the mission with great fervour, mentored by the great leaders like Dr S Srinivasan and Shri G Madhavan Nair. PSLV was a quantum leap from the ASLV which was in the final stages of realisation at that time. We were really proud to be part of

the greatest technological venture of Indian Space Research and I should say that the realisation of the subsystems and their successful qualification testing instilled great pride in all of us. We were receiving constant support from Dr SC Gupta in all our endeavours especially during the periodic status reviews by the Chairman, ISRO, Dr UR Rao. A sudden jolt to this seemingly dreamlike state of affairs came with the first failure of ASLV on March 24, 1987.

The true character of an individual comes out at the face of imminent mudslinging subsequent to failures.

When a cloak of gloom engulfed the VSSC community after ASLV failure, Dr Gupta stood by us and told 'Yes, the failure is a disappointment, but our determination to achieve self reliance in launch vehicle technology is not shaken a bit. The VSSC community has the will and capacity to work for success. I do not have to exhort them..' Yet again when ASLV D2 also did not achieve the intended mission, he said that it is human to be disappointed by failures but we have to work undaunted by them. He also said that a number of milestones like PSLV stage motor development and successful qualification



demonstrate that the failures have not impaired our capabilities. Instead we have gained a lot from them, as the analysis has enabled design refinements of PSLV systems. Dr Gupta did not fumble even a single step during those testing times. He stood firm and encouraged us to come out of the dungeon swiftly, which we promptly did on May 20, 1992 with an emphatic ASLV D3 success.

Dr Gupta organised some memorable events during his tenure at VSSC including '25 years of the first launch from Thumba' in 1988 and '30 years of rocketry in 1993' assembling all the veterans, honouring them and recollecting the trials and tribulations of the initial days thereby rekindling the team spirit that is the trademark of successes in VSSC.

On September 20, 1993, when the first development flight of PSLV could not achieve the mission, Dr Gupta was leading the team. For a complex venture like PSLV where a host of new technologies in all realms of rocket science and avionics were being attempted for the first time, even positioning a fully integrated vehicle on launch pad with qualified subsystems itself may be deemed as near to success. It becomes evident when we look at the build up for the first mission and the major accomplishments achieved. These include flight demonstration of big solid boosters along with six strap-on motors in the difficult atmospheric regime, flight testing two liquid stages for the first time, evaluation of high performance third solid stage motor, flight evaluation of RESINS with a performance matching with the tracking data from precision radars, linking of six onboard computers in redundant configuration to carry out the flight management

functions of navigation, guidance, digital auto pilot and sequencing, evaluation in flight of new control systems using engine gimbal and flex nozzle, qualification of giant light alloy structures, proving large bulbous heat shield employing isogrid technology, development of a variety of control components and control systems, reliable pyrotechnic systems, variety of stage separation devices, heatshield jettisoning system and the mission integration and management.

As part of PSLV programme, Dr Gupta had overseen the establishment of major infrastructure and facilities including sea level as well as high altitude test facilities at Mahendragiri for qualifying both second and fourth stage liquid engines, large fabrication facilities to deal with 3 m diameter rocket hardware, titanium machining and welding, production facilities for propellants, propellant casting and curing facilities and static testing facilities for 125 tonne solid boosters, facilities for qualifying massive light alloy structures and heat shield, assembly, integration, check out and ground resonance testing facilities, facilities for testing inertial sensors and simulation of entire mission, facilities for testing stage separation and heat shield jettisoning, massive mobile service tower, sophisticated mission launch control centres at SHAR, high precision radars in C-Band positioned at SHAR and Mauritius and Beryllium machining facility.

In short, everything was in place for the success of PSLV which eventually happened on October 15, 1994. Dr SC Gupta has relinquished the office on January 31, 1994, but was with us as MRR member to rejoice on the occasion. He could see the dream of all of us fulfilled

on that day using the systems and facilities he was instrumental in establishing. Dr Gupta continued to be with us as reviewer and as a well wisher for many more years as long as his health permitted. I vividly remember his participation and energetic and critical comments and questions during Integrated Technical Reviews of GSLV MkIII conducted during 2014.

Dr Gupta was one among the six stalwarts handpicked by Dr Vikram Sarabhai from abroad to pave the foundations of Space programme in India. With his life and vision Dr Gupta proved to us that if we follow the cardinal rules in technology viz., robust design, comprehensive test and evaluation, calculated risk taking and adherence to quality and safety we are sure to succeed. He imbibed in us the thought that we need not be humbled or humiliated by the stumbling blocks on the path to glory.

When Dr Gupta was not keeping well, I could visit him multiple times at his home, where I found him cheerful, speaking with usual enthusiasm and love for Vikram Sarabhai Space Centre.

On his sad demise, while acknowledging his contributions and wishing his family to gather strength to bear his loss, we will rededicate ourselves to tread further on the path set by him, to bring more glory to our nation.



Dr K Radhakrishnan

Chairman, BOG-IIT Kanpur & Standing Committee of IIT Council; Former Chairman, Space Commission/ISRO & Secretary DOS

An indomitable doyen of Rocket Science in India, Dr Suresh Chandra Gupta (born January 7, 1934) is on his traverse to the abode of God after a purposeful life till August 9, 2020.

Dr Gupta was one of the most senior Engineers handpicked for ISRO by Dr Vikram Sarabhai, in 1965, at the pristine infancy of Space science and technology at Thumba, Thiruvananthapuram. At the Space Science and Technology Centre (unified into the Vikram Sarabhai Space Centre from 1972), Dr Gupta built up diligently the Control, Guidance and Instrumentation Division; he conceived and created national capability with forethought for a suite of inertial sensors, onboard computers, navigation, guidance and control systems that formed the brain of India's Launchers SLV-3, ASLV, PSLVs and GSLVs; he was one of five member apex that assisted Dr Sarabhai on technical coordination and financial aspects of that multi-disciplinary institution.

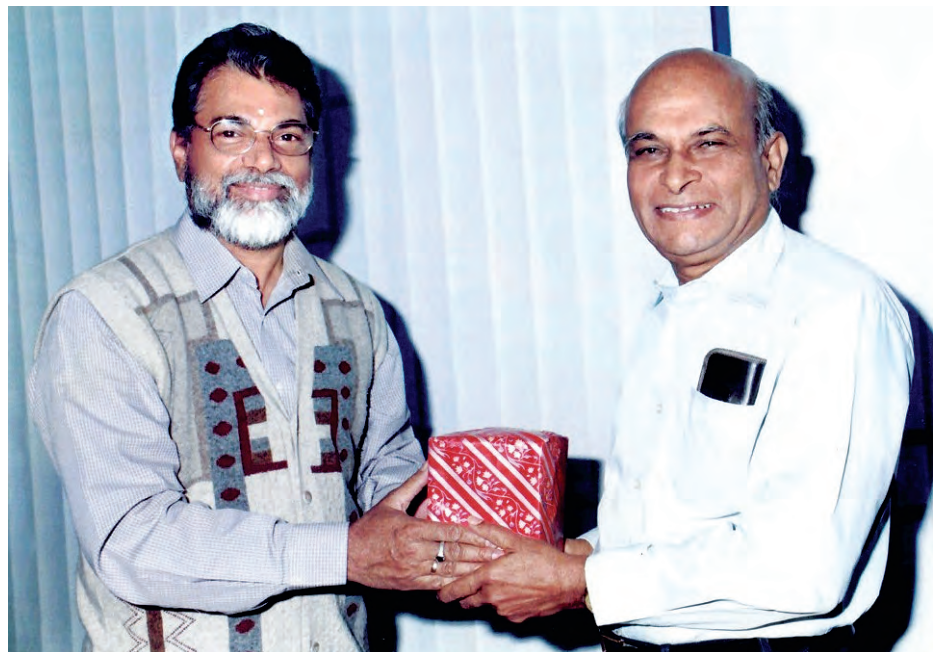
While narrating his reasons for shaping ISRO as an organisational entity in the context of Department

A Karmayogi of Space Technology from India

of Space set up in 1972, Prof. Satish Dhawan states: '....And I could not see any reason why a government organisation with people of the calibre of Dr Prakash or Dr Gupta or Kalam or a whole lot of people be participatory to decision making, and decision making by a process...' ['The Architect-Satish Dhawan', An Interview with Prof. Satish Dhawan, 'From Fishing Hamlet to Red Planet', Chapter 1.6, p. 48, Harper Collins]

In a significant structural transformation of VSSC during the mid-1970's, Dr Gupta was elevated as Chairman of Avionics Area Board and Director of Avionics Group, reporting to the legendary Director Dr Brahm Prakash as a trusted lieutenant. When his long-term colleague Dr Gowardiker was chosen to head VSSC in 1979, Dr

Gupta transformed himself into a close associate and anchor person for the new Director; that was an imitable display of professionalism, commitment, magnanimity and maturity. Elevated as Director of VSSC in November 1985, Dr Gupta steered the development of ISRO's launch vehicles ASLV and PSLV, notably in their most excruciating phase till January 1994 and paved way for success for his successors. His insights into the entire gamut of launch vehicle technology and systems engineering were truly remarkable and inimitable. Dr Gupta remained a 'Karma Yogi' and continued to share his wisdom on launch vehicle technology for generations of ISRO teams. Dr Gupta's book 'Growing Rocket Systems and the Team' with a foreword by Prof. MGK Menon



(Prism Books, 2006) was translated into Hindi during early 2010's.

I was fortunate to grow under Dr Gupta's tutelage in the formative decade of my career (1971-81), starting as a design and development engineer; pursuing management studies at IIMB; and later assisting him in system planning and technology management for avionics systems of SLV-3, ASLV and PSLV. While I moved to ISRO Headquarters in

1981, the parting advice from Dr Gupta was, 'I know that you hold a strong viewpoint on some of the current issues, rightly from the perspective of the VSSC. But if you come across more information at the headquarters, feel free to take on an objective view even if you have to deviate from the current one. I will be happy if you do that.' Such advice could emanate only from an evolved soul! I engraved those words in my mind as I prepared to leave for Bengaluru.' Dr

Gupta, like a true guru, continued to guide and advise me in the later years, even during my tenure as the Chairman of ISRO! Obviously, he is respectfully mentioned in 22 pages of my biographical sketch (My Odyssey..., Penguin 2016).

May his Soul rest in peace and bless all of us from the Heavens.



Dr BN Suresh
Former Director, VSSC

My association with Dr Gupta for two and half decades

Dr SC Gupta was a multifaceted personality, a brilliant Space engineer, an eminent expert in navigation, guidance and control system, a system engineer par excellence, a multi-disciplinary leader, an able administrator and more than anything else an excellent human being. I was very fortunate to have joined Control Guidance and Instrumentation (CGI) Division of the then Space Science and Technology Centre (SSTC) in the middle of 1969, which was headed by Dr Gupta. Since then, I worked with him till he retired in 1994, for almost two and half decades. Our association continued beyond this too and he

used to participate in many of our reviews quite often offering very valuable inputs. Dr Gupta always led the team with his exemplary capabilities in all domains and was indeed a great guru and role model for me. The kind of foundation one gets in one's career largely shapes his future. I was greatly influenced by such an eminent personality and the close interaction I had with Dr Gupta during the initial period helped vastly to shape my career.

Dr Gupta was one of the founding leaders of rocketry in the Country, specialised in navigation, guidance and control along with the mastery over all other associated disciplines. The knowledge base for the design and development of a launch vehicle is indeed very vast and has to involve physical and mathematical sciences and an array of esoteric technologies. In my opinion, Dr Gupta had mastered

almost all disciplines involved in the design of a launch vehicle and he was truly a system engineer. His contribution for the development of all Indian launch vehicles is enormous and very systematic. I distinctly remember that it was Dr Gupta who introduced the analysis, considering the parametric deviations for all input parameters of the subsystems of launch vehicles with their upper and lower bounds, to assess the system performance within the boundary of acceptable outputs. It was he who professed system theoretic procedure for analysis of such complex system, often referred as Monte Carlo Simulation. He was an excellent reviewer of systems, where he always analysed the problem in great depth and went always to the root of the problem at hand.

Soon after I joined SSTC, I was

asked to report to Dr Gupta. I got greatly moulded as control and system engineer under the spell of Gupta. His extraordinary abilities in looking at the problem holistically, considering all possible solutions to the problem, analyzing them meticulously and selecting the right one are indeed very unique. On the very first day I met him after joining SSTC, he discussed in detail about my educational background and my specialisation. At the end of discussion he informed that he has a project waiting for me. The assignment suggested was development of aerodynamic fin-tip control system for SLV-3. Since I studied all through my studies, mechanical engineering and specialisation in machine tools design, I was quite surprised and disappointed too. I told him that, I am never exposed to control systems during my entire education and I may not do justice to the project. The reply from Dr Gupta was that 'this is the precise reason; I am assigning this task to you. Consider this as a challenge and with this assignment you get an opportunity to learn a new discipline altogether. What is expected of an engineer is to learn continuously and try to build newer and newer systems'. Even today these words of Dr Gupta are ringing in my ears. As a youngster I was impressed by his words and decided to accept the challenge. I never imagined at that time that the decision I made on that day would change my career profile totally. On hindsight, I consider that it was a path breaking decision.

Dr Gupta, as Deputy Director, Avionics was responsible to build several high quality laboratories like inertial system laboratory, which became an independent unit later, actuation system laboratory, simulation laboratory, on-board



computer systems laboratory and several more. Dr Gupta always stressed on total self-reliance and gave a lot of encouragement to all young engineers to build state-of-the-art facilities in their area of specialisation. Under his guidance, during 70's, with the help of my colleagues, I was able to establish high quality actuation laboratory with excellent facilities in VSSC for the development of electrohydraulic and electromechanical actuators needed for launch vehicle control systems. Total self-reliance was achieved in this complex area and today all our vehicles use the indigenous actuators with satisfactory performance. Noting the excellence achieved by the team in this area, VSSC was given the responsibility to develop very complex quadruple redundant electrohydraulic actuators by Aeronautical Development Agency (ADA) needed for the Light Combat Aircraft (LCA), which has been successfully developed and qualified.

Dr Gupta introduced me to system engineering very early. When the System Society of India (SSI) was formed during the middle of 1970's in Delhi, Gupta was one of the founder office bearers and under his influence I became a member of SSI. When the first National System Conference (NSC) was announced by SSI in November 1973 at Indian Institute of Science, Bangalore, Gupta called and told me to submit a paper on fin-tip control system, stressing the system engineering aspects. He guided me in shaping the paper. It was the first time ever I presented a paper in such a large International Conference. It was well received by all delegates followed by active interactions. During the late 1980's SSI became inactive at Delhi where it was headquartered and for some reason the Society had become almost defunct. He called me and my colleague Dr BB Das to go to Delhi and shift the Society to Thiruvananthapuram. He had got the acceptance from Delhi

officials and the activities of SSI were accordingly shifted. We then reregistered the byelaws of the society at Thiruvananthapuram, sorted out all the useful papers. The Executive body was reconstituted with Dr Gupta as the President, me as the Secretary. In a short span of time the membership grew rapidly, the Society conducted series of workshops and conferences. In a few years we could build the society on a very firm foundation with respectable funds to institute awards and conduct other activities. We also started the publication of the 'Journal of systems science and engineering'. It became quite popular with contributions from all IITs and other reputed institutes in India and was subscribed by around 40 libraries. This is how I was closely associated with Dr Gupta and learnt a lot on system engineering. I was appointed as President SSI to carry on his legacy after he relinquished the post as President SSI.

During my long association with Dr Gupta, I was very fortunate to have worked with him in a large number of projects closely for almost two and half decades. Close association with him in several projects will be remembered always and they were of great excitement and enjoyable. He never treated his colleagues as subordinates but as equals. Dr Gupta always challenged himself and wanted to go beyond any conventional system. In the very initial stage of SSTC, we had a number of projects defined by Dr Sarabhai like design project stage 1 (DPS1), stage 2 (DPS2), stage 3 (DPS3), etc., and also design project guidance package (DPGP), as a prelude to generate vital technical design inputs needed for SLV3. I was an active member in DPGP. Considerable amount of time was spent in looking at the options

and in making the right choice for inertial sensors, inertial systems, guidance system, control power plants and control algorithms. It was a good learning turf for me particularly on NGC system. I still remember that the discussions used to continue late in the evening most of the days. Finally, an excellent document was generated; a copy of the same is still available with me. These documents were effectively utilised subsequent to formation of SLV-3 project, under the leadership of APJ Abdul Kalam.

During the development of Polar Satellite Launch Vehicle (PSLV) the concept of system projects was introduced. For avionics systems the system project was 'Inertial Guidance and Electronics Project' (IGEP) with N Vedachalam as Project Director for Inertial Guidance system Project and Shri G Madhavan Nair for the Electronics Project. Each system project had a Project Management Board (PMB) to review and guide the developmental activities and Dr Gupta was the Chairman for IGEP Board. He appointed me as the Secretary of the Board. Regular monthly meetings were held, often continuing beyond regular hours due to his style of getting into details. These meetings became very fertile ground for me to learn whole gamut of avionics technologies. Preparation of the record of discussions also used to be very tricky and the advice of Dr Gupta made my job a lot easier. A few years later, I was given the responsibility to lead the inertial guidance project for both PSLV and GSLV.

Dr Gupta took over as Director, VSSC in 1985 and served for nine long years in this capacity. This decade was the learning phase for all launch vehicle technologies.

ISRO faced failures of Augmented Satellite Launch Vehicle, ASLV D1 (in March 1987), ASLV D2 (in July 1988) and PSLV D1 (in September 1993). He was able to take these failures in their strides, conducted number of reviews with external experts from national academia and R&D laboratories and ensured the much needed success in these projects. Dr Gupta was appointed as the Chairman for the failure analysis committees for both ASLV-D2 and PSLV-D1. Unfortunately, in both these systems the cause for the failure was essentially in control systems, which I was heading. Thus our interactions during the failure analysis became very intense, spending almost 16 to 18 hours continuously for several days engaged deeply in discussions and analysis of failure scenarios. Surprisingly, a couple of times he walked into my room to discuss and examine closely the analysis and simulation results. I was indeed touched by his simplicity and also his eagerness to get to the bottom of the problem. He examined not only the cause for the failures of ASLV-D2 and PSLV-D1 but also demanded the detailed analysis on the performance of all other subsystems to ensure that systems as designed are indeed robust and the next flight should not get into any problem with any of the vehicle systems. After the failure of second flight of ASLV, four years were indeed testing time for Dr Gupta. His relentless efforts in steering various reviews, overseeing the modifications in systems wherever recommended have no doubt led to achieve the much needed success on May 1992. The entire gamut of lessons on rocketry was learnt through this single failure. Similarly we also achieved success in PSLV D2 on October 1994 but he was not holding the mantle

of office of Director VSSC as he had superannuated a few months earlier.

Immediately after PSLV-D1 failure, I discussed with Dr Gupta that there is a need to bring in the vehicle simulation efforts under one umbrella, which otherwise was coordinated with several Divisions across the Centre. He listened patiently and subsequently discussed with Project Director PSLV and Chairman ISRO and the result was formation of Mission Simulation and Synthesis Group (MSSG) consolidating all wings of simulation and also posting the right bright scientists to manage it. All these things were implemented within a span of three weeks from the failure of PSLV, which in my opinion is a quick and remarkable decision. Today this simulation laboratory has become one of the world class facilities and any VIP visitor to VSSC is taken to this facility. Similarly, some of us proposed to develop high frequency angular motion simulator using both electrohydraulic and electromechanical systems needed for launch vehicle simulation with large budget outlay. The realisation of such a system with very high accuracy was indeed a tall order but Dr Gupta reviewed the proposal for almost half a day and got convinced that this project has to be supported. We were able to realise the same with the help of Industry and used effectively in our simulations. He never used to hesitate to approve a project once he is satisfied that the design is sound and the capability for its realisation exists.

In order to speed up the development of GSLV-Mk II, the Department decided to enter into contract with Russia for the supply of cryogenic stages in

January 1991. At that time there was a proposal to undertake the development of electronics from ISRO while Glavkosmos (GK) would undertake the development of the engine and stage. However, there were serious apprehensions that this would lead to confusion in the event of any problem during the engine and stage tests at Russia with our electronics. Dr Gupta had great faith in our scientists to develop top class electronics and supported strongly the indigenous efforts which helped to make the right decision. He also strongly believed in entrusting the realisation of launch vehicle hardware through our Industries. While heading the Avionics he gave a major thrust for avionics production through a number of industries.

What I admire most in Dr Gupta is his penchant to promote the leadership and gave a lot of autonomy to his young

subordinates to carry on the tasks assigned to them independently with periodical review and guidance. Most of his associates went on to become Project Directors, unit Directors, Centre Directors and a couple of them even Chairmen ISRO. The culture of practicing system engineering in everything we do also helped immensely to assume the leadership roles.

When myself and Dr Sivan completed the manuscripts on our book 'Integrated design for space transportation system', we were very particular to have a critical review of the book by Dr Gupta, a pioneer in launch vehicle design. But we were hesitant to request him as the size of the manuscripts was quite large. Nevertheless, when we approached him in 2014 he readily agreed to do the needful. To our surprise he took extra efforts in going through the



entire manuscripts and offered very valuable comments, wherever he felt essential. We incorporated all his suggestions in the book. He also provided, as his consolidated review comments in a separate write up 'Nuances of Space Transportation Systems', which have been included in our book. His comments are very concise summary of launch vehicle design, consolidated in just four pages.

I can also recollect the good reminiscences, we had beyond official interactions. We used to have occasional family get together and used to meet quite often in many of the programmes organised by the cultural associations. He was always kind hearted, very attached and affectionate to me and we had many cherished memories together. Words will not be enough to express my thanks

for the continued guidance, support and consideration he has bestowed upon me all through the years. I am extremely proud and fortunate to have had Dr Gupta as my mentor and guide, who had an excellent understanding of all technologies needed for launch vehicles and who had made tremendous contributions for the development of launch vehicles, space technologies and system engineering in the Country.



N Vedachalam

Founder Director, IISU and Former Director, LPSC

Dr Gupta – an Embodiment of Guru

I was getting ready at Trivandrum Railway station for joining ISRO, there was a heavy downpour of monsoon rain but by the time of reaching TERLS gate, bright Sun light with splendid breeze characteristic of 'Karkidokam' welcomed me. I walked all the way from TERLS gate to church building on the sea shore road with a panoramic Arabian Sea view. It was the day കൊല്ലവർഷം 1144, കർക്കിടകം 7 (July 21, 1969) morning at 10.30 am. I joined ISRO along with BN Suresh the same day and time. That first day we met Dr SC Gupta as Head, Control Guidance and Instrumentation division located

in the St. Magdalene church. He briefed me about the research and development activities of the CGI division and arranged my seat along with all my colleagues in the Sanctum Sanctorum of the church, where Jesus Christ was blessing all of us with both hands! It was a memorable day in my life.

The instrumentation activities were strain gauge based pressure, load/thrust & acceleration measurements for sounding rocket application. Dr Gupta arranged a tutorial on 'INERTIAL NAVIGATION SYSTEM' (INS) by Mr. Joglekar, a MS student of MIT, USA. I approached Dr Gupta with a detailed proposal for R&D of critical sensors for INS, he gave me necessary guidance and a small team to prepare a project report for presentation to the then Director SSTC, Dr Vikram A Sarabhai. Dr Sarabhai was extremely pleased with the Rate Integrating Gyroscope (RIG) project

proposal and approved a visit to Switzerland, Germany and USA for both Dr Gupta and me. Early 1970 CGI division was relocated to the Veli Main Building, where we could establish the GYRO LAB. Dr Gupta enabled me to establish a Precision Instrumentation Laboratory, Super clean room and Inertial Sensors and Systems Test Facility in the circular building.

During the definition phase of SLV-3, two design projects were identified for the CGI division viz Rate Gyro Package (RGP) and Strap-down Inertial Navigation System. After formal sanction of SLV-3 Project, Vikram Sarabhai Space Centre was reorganized. Dr Gupta was Group Director, Avionics Group with four divisions and he recommended my name for Head of Inertial Systems and Instrumentation Division (ISI). Thus under Dr Gupta's guidance a small Gyro team became a

section in CGI and emerged as an independent division. With the successful achievement of SLV-3 Project, the next generation ASLV project was primarily to establish closed loop Inertial Guidance and Control System technology development for Avionics Group. Dr Gupta nominated me as Project Director for Inertial Guidance System Project (IGSP) and Shri G Madhavan Nair as Project Director Electronics Project. Dr Gupta as the Chairman of IGEP Management Board extended all the required support from the Avionics group. On voluntary exit of Dr Vasanth R Gowarikar, Dr Gupta was appointed as Director, VSSC and he nominated me as Group Director, Navigation, Guidance Control Group (NGC) under Avionics and Mission Design (AVMD) Entity of VSSC. During a decade of Directorship of VSSC, Dr Gupta encountered two consecutive ASLV missions and also the first PSLV mission failure. His leadership and directions enabled the Launch Vehicle Projects ASLV and PSLV to eventually achieve successful missions, but he superannuated before that.

When I proposed an independent Centre of excellence for ISRO Launch Vehicle and Spacecraft Inertial systems, he wholeheartedly supported the same and the birth of ISRO Inertial System Unit (IISU) in the year 1990 happened. He was a member of Space Commission during the last year of his service and on superannuation he was bestowed with Dr Brahm Prakash Distinguished Professorship for 3 years.

It is not my intention to chronicle Dr Gupta's emergence as a techno-managerial leader in ISRO, but we could follow his footsteps to achieve total self-reliance in the respective areas for Launch Vehicle and Spacecraft programmes of ISRO. Whenever we drafted a new proposal, a creative idea, or an innovative concept, Dr Gupta used to painstakingly correct the English part meticulously as there was no 'Microsoft Word' in those days!

Unlike his counterparts who created STEX, SPROB, SHAR, LPSU, LPSC, ISSP, ISAC, etc., Dr Gupta concentrated on AVIONICS

for Launch vehicles and made it totally self-reliant. He built teams and enabled them to stand on their own. He identified the need for NASA standard soldering skill for flight Avionics packages which still exists in VSSC as a soldering school. He was also responsible for skill development of local educated and physically challenged men & women in the electronic packages manufacturing on a sustainable basis and that exists today.

I sought one day Dr Gupta's advice for Hindi tuition for my daughter who was studying at Kendriya Vidyalaya, along with his younger daughter. He spontaneously requested Mrs Gupta to give Hindi tuition for my daughter and to that our family extends gratitude lifelong.

On the day of his superannuation, Dr SC Gupta as Director, VSSC called me and asked what was the best and austere way to celebrate. I told him that 'you came all the way from Dholpur in MP and dedicated your entire life here at Thiruvananthapuram. Let me arrange a special worship for you at the Shri Anantha Padmanabha Swamy temple and seek the Lord's blessings'. No second thought, he readily agreed. Both Mrs and Dr Gupta had a special darshan at Padmanabha Swamy temple the following day immediately after the royal visit. Dr Gupta started his official work in the St. Magdelene church and completed his service at Sree Padmanabha Swamy temple. This episode was reminded to me by the bereaved Mrs Gupta, when I went to his house to pay my last respects to the mortal remains of Dr SC Gupta. May his soul rest in Trivandrum and peacefully.





SC Gupta – a pioneer with gentle touch

ES Padmakumar

Deputy Director, VSSC (CGSE)

Dr SC Gupta was Director, Vikram Sarabhai Space Centre at the time of my joining the organization in September 1986. He was among the first of the dignitaries to have come over to Thiruvananthapuram and had joined the Indian Space Programme in 1965 with a PhD from University of Pennsylvania and after brief stints in US companies. He pioneered the developments in Control, Guidance, Instrumentation and Hardware in loop simulations in the Centre. He also nurtured the Avionics development from its initial days and played key roles for the design of Navigation, Guidance and Control systems for the first generation launch vehicles SLV-3, ASLV and later PSLV which was to become our most trusted workhorse launch vehicle.

The period of ASLV D1 & D2 (1987-88) under his directorship was quite a difficult period as two consecutive ASLV missions ended up in failures. It ought to have been really painful for Dr Gupta as some of the causes were attributed to NGC systems, which was Dr Gupta's forte. But he was not shaken by those failures, but stood resolute and led from the front. He established the root causes through rigorous analysis and simulations, instituted several improvements, and resolved the problems which eventually led to successes of ASLV-D3 & D4 missions. In 1993, PSLV-D1 could not achieve the intended mission due to a Control software implementation issue. The analysis and fixing of the error also led to institutional changes and an independent simulation facility and QA for software came into being. Several significant concepts in NGC, such as RTD (Real Time Decision) in sequencing, Impact of Winds and Gusts, ensuring higher robustness of Digital Auto-Pilot (DAP), handling

the stage transitions and validation strategies using stress-Onboard Computer In Loop Simulation (OILS) followed by Hardware In Loop Simulation (HLS) & Actuator In Loop Simulation (ALS), etc. came out of these analyses. Those years of intense learning are the rocks on which the current excellent competence in NGC of launch vehicle systems is built.

Dr Gupta was always very gentle, soft spoken and unassuming. It is apt to recall his words, 'We shared the joy of fabulous successes and disappointments of our share of failures. We accepted both with equanimity, keeping our focus on higher goals with determination to succeed'. These two sentences truly reflect his view of doing groundbreaking work in rocketry. The CGSE team, fondly remembers him as the pioneer of our activity, and cherishes the gentle touch with which he directed our growth.



Dr Gupta – a revered personality of values and virtues

Dr S Geetha

Programme Director, STS

Dr SC Gupta, a doyen in the field of control systems and avionics was familiar to me since

the beginning of my career in VSSC, while attending various design reviews and meetings as a junior design engineer. Being a control engineer, I had a deep respect and admiration of Dr Gupta, who

had in-depth knowledge in control systems.

I joined the erstwhile Control Guidance Division (CGD) led by Dr BN Suresh in the third week of

May 1989 after my post graduation in Control Systems. After the successive failures of ASLV D1 and D2 flights, rigorous analyses, discussions and various design modifications were the major activities in the Centre during that period. I still recall an elaborate interview in the June 1989 issue of Countdown with Dr SC Gupta, Director, VSSC covering the findings of Failure Analysis Committee (FAC) and Expert Review Panel (ERP).

ensuring success for D3 mission. The activities related to first mission of PSLV was also in full swing.

Two new major systems were introduced in ASLV and PSLV, the Closed Loop Guidance (CLG) and the Digital Autopilot (DAP). CGD was responsible for both systems and as a control system expert, Dr Gupta used to take many reviews. Thus from the initial days of my career I received

related to advanced control design techniques at VSSC. The possibility and usage of advanced control design in the autopilot was first initiated under his leadership and stabilization of slosh modes of PS4 stage without baffles was demonstrated.

I was lucky enough to closely interact with Dr Gupta, when I moved to GSLV Project in 2007 as Deputy Project Director (Mission) and later as Associate Project Director (Mission). In GSLV, the then Project Director Shri G Ravindranath, assigned me the task of briefing the entire mission related activities to Dr Gupta before every MRR, to get his views and blessings. I did the job happily and meticulously, as it was an opportunity for me to interact with such a revered personality. I used to fix appointment, used to go prepared covering various aspects in other related fields apart from mission. He was very punctual in the sense, when the car reaches in front of 'Vidya', Cheruvikkal, he will be ready in the portico waiting for me. He was very particular that I should drink at least a cup of water. Till recent past, almost all household activities were handled by the Gupta couple.

Truly speaking, I used to prepare like a DPC candidate before visiting him, because questions can be expected from various directions, why? what was the scenario previously? whether it is the first time? incidences similar to this in earlier attempts or simulations?, etc. By God's grace I could do justice to all his queries and clarifications. Later, my Project Director got feedback from Dr Gupta that I had successfully accomplished my assigned mission of satisfying him.

Immediately after joining, the task given to me was to attend all the review meetings of the FAC and ERP to get acquainted with various aspects of launch vehicles. There was a specialist team to study the control related problems headed by Late Prof IG Sarma, IISc and experts from institutions of eminence. The activities in our division were hectic in terms of designs, simulations, duplicating failures and also for arriving at proper solutions for

many opportunities to interact with him, as I was involved in the PSLV DAP activities. In those days computational facilities were limited, except for the CDC Cyber 170/730 system and few Personal Computers. But the designers had the expertise and skill to analyze and interpret the behavior of various systems with ease.

Soon after superannuation, Dr SC Gupta initiated studies



GSLV-D3 mission in April 2010 with the first indigenous cryogenic stage was a failure. The ignition of CUS stage couldn't sustain, being the attributed reason for the failure. Soon in the same year December 25, GSLV-F06 flight also took place and it was also a failure. The GSLV-F06 failed at around 47.6 s of first stage flight, and later the reason was attributed to the increased compartment pressure of the lower shroud at the aft end of the cryo stage beyond acceptable levels and as separation plane connectors in GS2 stage-CUS stage interface demated during 47.34s – 47.65s.

After the successive failures, a Committee was formed with Dr Gupta as Chairman and myself as Convener. Soon, Dr K Sivan, present Chairman succeeded Shri G Ravindranath as Project Director, GSLV in April 2011. As an expert in all domains of mission related activities of all ISRO launch vehicles, he evinced keen interest in the activities related to this analysis and during his tenure as Project Director, had gone through each and every aspects of all the previous GSLV flights, including the flights with Russian cryogenic stage. In all our GSLV-PMC meetings, Sivan Sir, in his own jovial way, used to highlight the analysis of lateral acceleration, which Dr Gupta and myself were concentrating as G-G (Gupta-Geetha) problem. We started the analysis, because this peculiar failure happened exactly near to the Mach number 1. Further we analyzed all the previous flight data and established that the lateral acceleration is not the cause of the failure. During Sivan Sir's tenure as Project Director in GSLV, the practice of briefing Dr Gupta on mission activities of GSLV-D5 was continued and again

the task was assigned to me. The qualities to be appreciated were Dr Gupta's promptness, punctuality, humbleness and frank views.

Another facet of Dr Gupta was his keen interest and affinity to the field of Systems Engineering apart from his official engagements. He spearheaded the systems movement nationally. He nurtured and brought up the Systems Society of India to greater heights and was its National President from 1996-2003. I also had the opportunity to volunteer for the National Systems Conference (NSC-96) hosted at VSSC under his able leadership in 1996. The NSC-98 was organised at the then Regional Engineering College, Kozhikode. Typical to Kerala, it was a Bandh day and I still recall the travel of VSSC team from Kozhikode town to Chathamangalam in a police van arranged by the local organizing committee. He also took a lead role for starting the publication of 'Paritantra' which was later renamed as Journal of System Science & Engineering. Those days when internet was not that popular, he was keen in hosting a website for SSI - sysi.org. I had very close association with him through System Society of India volunteer activities as well as in get-togethers organised during the annual general meetings. He used to participate in those events with full heart, organised at Hassan Marakkar Hall.

During recent years, his visit to VSSC became less frequent. He visited the Centre on August 13, 2015 to speak in the reminiscence meeting paying homage to Dr Kalam organised at Dr Srinivasan Auditorium. A book 'Integrated Design for Space Transportation System' authored by Dr BN Suresh and Dr K Sivan was published by

Springer. I was associated with the book for proofing and verification of equations. Dr Gupta visited VSSC on April 2016 and a copy of the book was handed over to him by the authors during his visit. I recall that it was the last visit to VSSC by Dr SC Gupta and was the last public function attended by him at VSSC.

A colloquium on 'System Engineering and Institution Building' was organised by IIST and VSSC along with various professional bodies on February 9, 2019 to honour Dr BN Suresh, Chancellor, IIST. I met Dr Gupta in February 2019 to collect a message for the Souvenir and also to invite him for the function. His voice and views were very strong. He expressed his inability to attend and told with a laugh that, though my mind is strong, my body doesn't allow me to come. He dictated the message to me. He was very keen that I should read out the final version over phone to confirm that it has come in the right way. It was the last occasion I met him.

He is an epitome of knowledge, punctuality, dedication and humbleness. His house and its interiors and surroundings stands testimony to his simplicity and humbleness. We had several occasions of meetings and lunch. He used to tell me that, now a days as age goes up, kindly bear with me, I will take some more time to finish. Often he preferred to go back home for lunch, even after extended hours of meeting.

I bow with respect while reminiscing about him, the Gupta era will remain in memories of control designers and system engineers forever.





Dr SC Gupta – the doyen who pioneered Avionics

M Narayanan Namboodiripad
Deputy Director, VSSC (AVN)

When I joined VSSC in 1984, Dr SC Gupta was the Deputy Director, VSSC (Avionics). Avionics was a big and prominent entity of VSSC at that time. From that entity only the present AVN, CGSE entities and the IISU unit has evolved. I now feel most privileged to be in the same seat after 36 years, walking in the shadows and working along with many great leaders starting with Dr SC Gupta, the pioneer who literally nurtured the growth of Avionics in this centre from rudimentary turret wired analog circuits to the sophisticated microprocessor based redundant onboard computers. Drawing inspiration from the vision of the pioneers the entity has progressed with many new developments including processor indigenisation and development of fault tolerant

systems right from sensors to high power electro-mechanical control systems.

On reporting to Dr Gupta's office in 4th floor of MSB, VRC area, I was asked to report to Control and Guidance Division (CGD) headed by Dr BN Suresh. During that time the design activities of PSLV systems have just started. There was no system of IITP or any other induction training in those days. I was straight away asked to work for the development of PSLV third (FNC) and fourth stage (LUSC) control systems development activities. As a very junior person I was not having any opportunity for close interactions with Dr Gupta sir. But every month he used to take review of CGD activities where the progress of FNC, LUSC and PS2 EGC systems were discussed and debated thread bare. For a young engineer who had just joined from college, the challenges offered by the development and

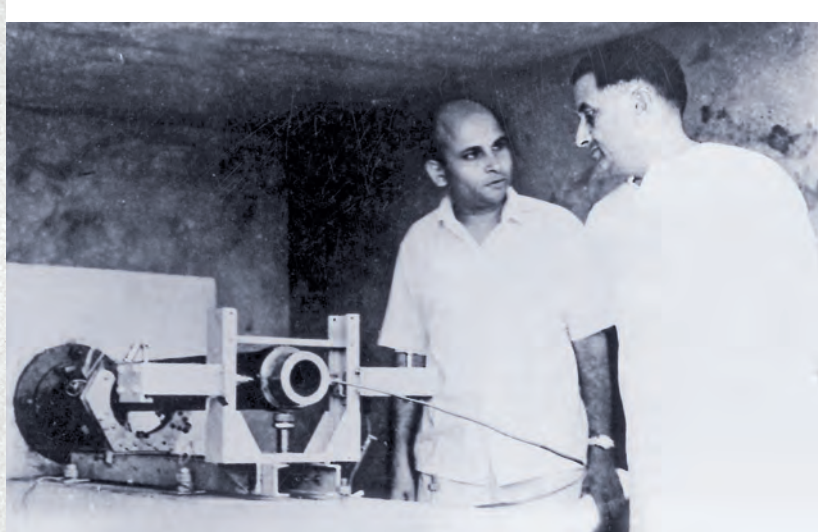
those technical reviews were really avenues for gaining more technical knowledge and gathering practical experience. Those were the era of learning through work. I vividly remember the day when all the three upper stage control systems were tested and demonstrated to Prof. UR Rao, then Chairman of ISRO, along with digital controller and PWM power drives developed by us for which Dr SC Gupta and Dr Suresh took a lot of effort.

Yes as all of us know that he led the organization during the difficult times of ASLV and PSLV failures. The resilient leadership of visionaries like him only made ISRO gain the present stature.

Now sitting in the chair of DD, VSSC (AVN), assimilating the credit and joy of each new development, I dedicate myself to the selfless service to our country, in memory of Dr SC Gupta. I bow my head with these lines of Bhagavath Geetha.

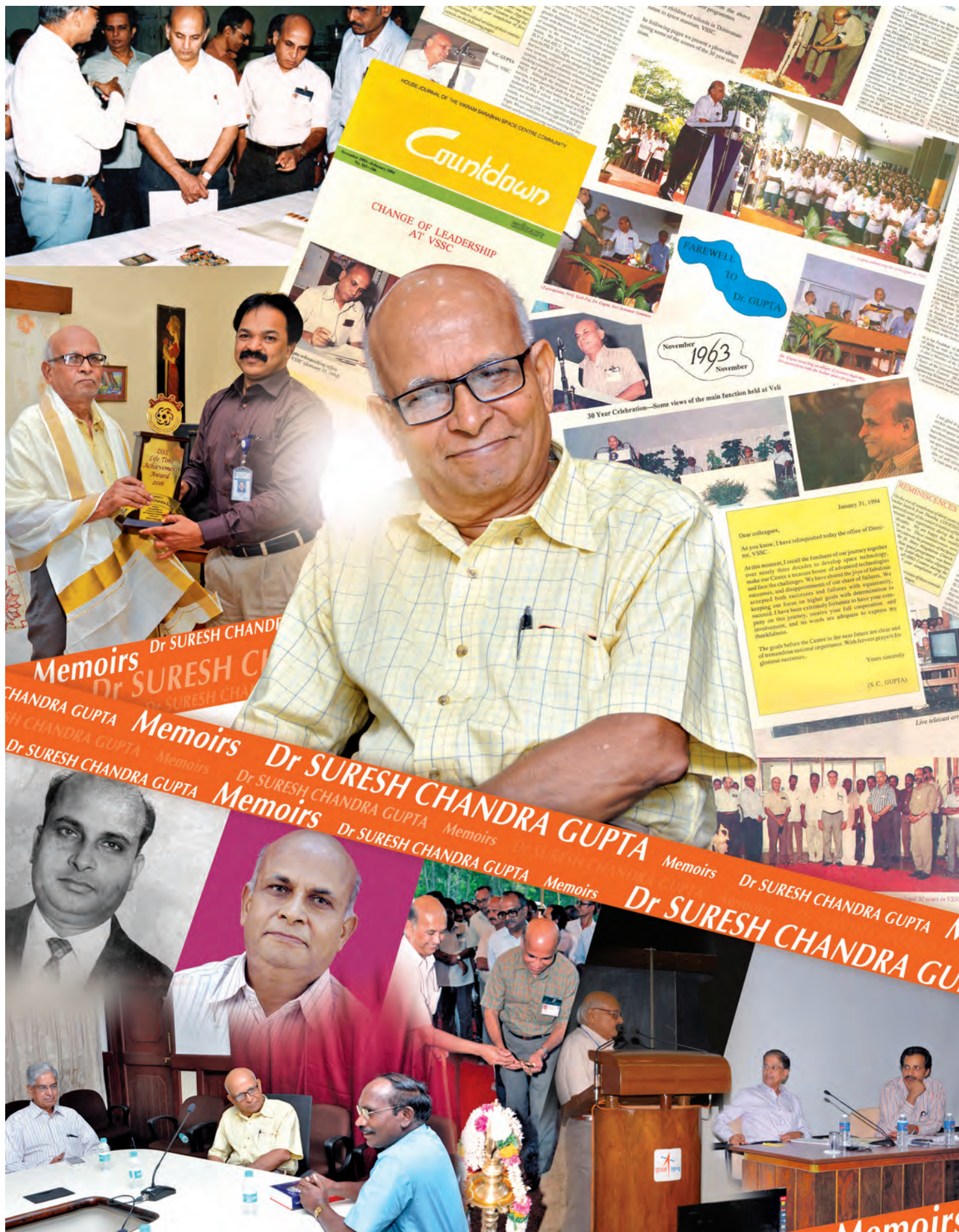
यद् यदाचरति श्रेष्ठस्तत्तदेवेतरो जनः ।
स यत्प्रमाणं कुरुते लोकस्तदनुवर्तते ॥ २१ ॥

Translation : Whichever and however a great personality conducts himself, common men also do; whatever he accepts as authority, that and that alone certainly all the world will follow.









Dual FLSC system for HRLV S200 separation

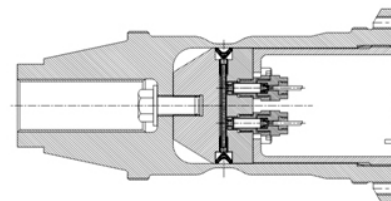
In GSLV MkIII, separation of each spent S200 booster from the ongoing vehicle is achieved by severance of one Pyrobolt at the fore end and three links at the aft end by Flexible Linear shaped Charge (FLSC). Even though, the pyrobolt and pyrolinks have identical severance mechanism, they have different interface configuration to meet the fore and aft end requirements. Both of these devices are of 17-4-PH material and is 3.5 mm thick at the separation plane. Based on the geometric constraints, FLSC is bent to a diameter of 90 mm to form a ring and assembled inside the bolt/link so that it effectively severs the tubular structure at the desired section. Towards meeting redundancy requirements, two electrical detonating cartridges are used for initiating the FLSC ring.

Currently, GSLV MkIII employs only single FLSC for severance in the pyrobolt/link. However, towards meeting the quadruple redundancy as mandated for Human Rated Vehicles, the single FLSC based S200 separation pyrobolt/link has been modified with dual FLSC having four electrical detonating cartridges. In this configuration, functioning of either one of the

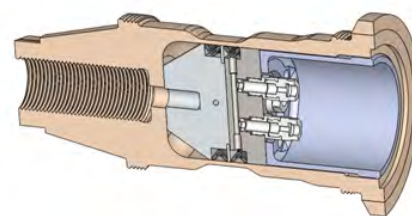
FLSC is adequate to ensure the bolt/link severance. The challenges in the modification were to make a suitable configuration for accommodating four detonating cartridges in the limited space and to avoid additional metallic debris generation, while retaining the functional aspects and the pedigree of the existing device.

As in the existing design, in the new configuration also, each FLSC is initiated by two detonating cartridges. The locations of the detonating cartridges are suitably oriented considering the space availability. Further, for positioning the two FLSC rings, the need for extending the thin section had arisen. In addition, a suitable spacer also had to be placed between the FLSC rings for its proper assembly. Considering these aspects and to prevent the possibility of additional debris formation during device function, a new concept of providing a thin non-metallic spacer between the FLSC rings is implemented.

A test article, with the dual FLSC configuration, in the truncated level simulating the cutting region of the bolt/link, was realised and functionally tested at ASOE.



► S200 separation pyrolink (single FLSC)



► S200 dual FLSC separation pyrolink

Towards demonstrating initiation redundancy, only one of the two detonating cartridges for each FLSCs were triggered in the test and perfect severance was observed.

PhD awarded

S hri V Vipin Vijay, CMPD/PCM has been awarded the degree of Doctor of Philosophy by National Institute of Technology (NIT), Tiruchirappalli for his thesis titled 'Active Filler Controlled Preceramic Polymer Pyrolysis: Advanced Ceramics & Composites'. The research was carried out under the joint guidance of Dr VM Biju, NIT, Tiruchirappalli and Dr Renjith Devasia, PCM.



Dr V Vipin Vijay

101st birth anniversary of Dr Vikram A Sarabhai

Commemorating the 101st birth anniversary of Dr Vikram A Sarabhai, on August 12, 2020, VSSC community paid tributes to the founding father of Indian Space programme in a solemn function held at Vikram Sarabhai Space Centre. Adhering to the social distancing and other Covid-19 protocols, a specially invited representation of VSSC community including VCMC members, Senior administrative staff and staff side leaders paid floral tributes at the bust of Vikram Sarabhai. Addressing the gathering Shri S Somanath, Director, VSSC observed that the valedictory function of Vikram Sarabhai's birth centenary year was planned in an elaborate manner but at present we are constrained by the situation. Nevertheless we use this opportunity to pay our respects to the great soul and to rededicate ourselves to march forward in the path shown by him to bring more laurels to our nation.

Supercapacitor technology to industry

VSSC has developed the technology of processing Supercapacitors of varying capacitance values viz., 5F, 120F, 350F and 500F for catering to specific applications related to Space and societal needs.

In accordance with the established policy of ISRO of encouraging Indian Industries for productionising matured technologies, the technology of Supercapacitor cells was transferred to KELTRON Component Complex (KCCL), Kannur on August 14, 2020. The Technology Transfer agreement was signed by Dr SA Ilangoan, Dy. Director, VSSC (PCM) in presence of Director, VSSC.



▶ Handing over of technology transfer document

XBS full scale functional test conducted successfully

Small Satellite Launch Vehicle (SSLV) is configured as a three stage solid propulsion based vehicle, with 2 m outer diameter. Standing ~34 m tall it has a gross lift-off mass of ~120 tonnes. Expanding Bellow system (XBS) is being developed by HSPD/ASOE for SS2 stage separation in SSLV. The functional requirements of the system include separation of 282 nos. of Ø4.8 mm AA2024-T4 rivets along the peripheral structural joint followed by imparting a jettisoning velocity with minimal body rates for a collision free separation.

The concept of using a bellow based system for stage separation

is first of its kind in international scenario and therefore, put forward various design challenges. Conventionally, bellow based separation systems (LBS) are employed in Payload Fairing (PLF) separations where contamination is restricted and jettisoning velocities are crucial. Such systems are required to separate relatively leaner rivet distributions while jettisoning considerably lower masses. Although, pedigree of LBS was readily available for reference, the evolution of XBS turned out to be a complete re-invention.

XBS development entailed several design challenges due to

significantly augmented system requirements viz. higher pressure for larger separation forces rendering present bellows unusable, inadequacy of conventionally bonded end adaptors, twin tube attenuator assemblies being impractical with a large curvature, end configurations requiring oversized cut-outs, etc. These criticalities were unprecedented in literature and thereby implored an array of new ideas.

Commercial fire retardant hose modified with an in-house Rocasin liner for shielding was envisaged as a high calibre bellow. The Rocasin liner sleeve developed by RPP was

bonded inside the bellows with a new resin, EPIN developed by PSCD/PCM. With a burst strength of 45 ksc (min), these bellows were notably superior to the conventional bellows having 20 ksc strength while their ample availability along with exceptionally short lead time and lower costs was noteworthy. XBS piston-cylinder configurations were tailored around these bellows. The end adaptors were freshly devised with a mechanical taper jamming configuration devoid of any need for bonding and were tested to withstand burst pressures. Attenuator assembly with the twin tube configuration was replaced with a novice single tube filtering mechanism for efficient and convenient realization while eliminating all the intricacies of holes offsetting and welding. Initiation interfaces were also modified into compact submerged booster configurations thereby significantly reducing cut-out lengths.

SS2 separation requires a pull-out length of 2.8 m with a radial clearance of 108 mm (min). Energy dispersions between the two halves of the system worsened by a possible delay of the order of 2-3 ms in actuation due to independent detonating cartridges, posed severe threats to an acceptable separation dynamics. Introduction of an interconnection as in LBS was unworkable without

increasing cut-out dimensions. A unique mechanism called XBS coupler (a retractable leak tight piston-cylinder arrangement) was conceived in order to carry over a common cluster MDC across the two halves of XBS. The scheme with a common MDC and interconnected expansion volumes remedied the concerns related to detonation delay and wide energy dispersions, thereby keeping the development afloat.

The realization of such a complicated and highly dimension sensitive set of hardware was a daunting task in itself and was proficiently steered by the CPSF/MME. Assembly of the first ring level system was subsequently completed by HESG without any complications.

Full scale testing of XBS required simulating the ongoing and spent stage masses (6T & 1.5T respectively). An existing framework at MVIT (originally realized for GSLV OPLF separation test), met the mass and test requirements was transformed suitably as a provisional test fixture while aiming to execute the first developmental test in the shortest time with minimal fabrication activities. The objectives of the test were limited to demonstrating system functionality with respect to clean separation and post functional integrity while a preliminary assessment of the

shock levels and verification of the estimated velocities were also on the charts. Teams from SSLV, ASMG, LMIG, STS, STR, FMG & SR supported the configuration and realization of the test setup.

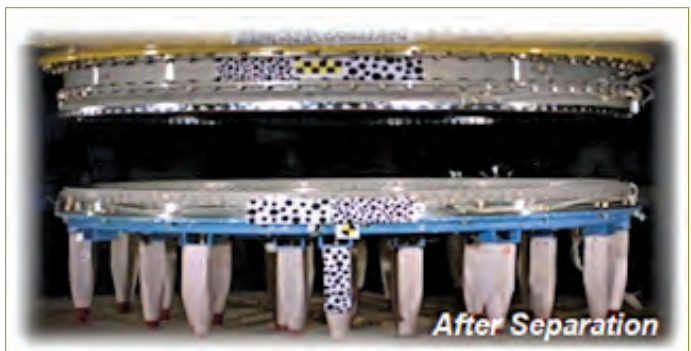
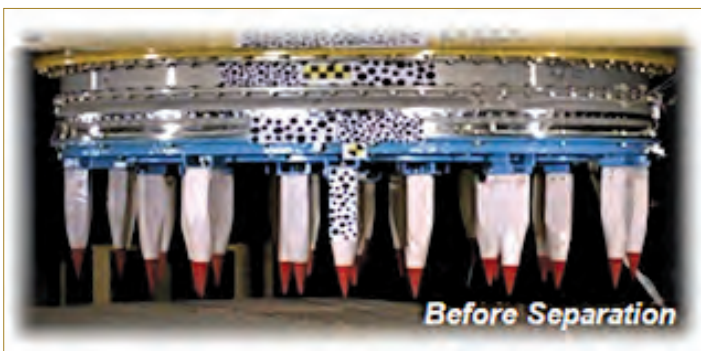
XBS full scale ring level test was successfully conducted on July 1, 2020 at Zero 'g' facility, ASMG/MVIT.

System performance highlights:

- Clean severance of all the separation rivets.
- Jettisoning velocity attained : ~4m/s
- All the test objectives accomplished.

Director, VSSC, while appreciating the development commented that the blemish less performance in the first test itself indicates the maturity of the next generation of ISRO to perfect a new design. The guidance by the experts is also appreciated.

The system design, realization and testing of XBS was another example where a wide spectrum of agencies with diverse range of expertise in VSSC converged to a common cause with a pristine achievement.





Independence day celebrations

The 74th Independence Day was celebrated in VSSC with flag hoisting ceremony in front of the Main Building, VRC. This year, due to the spread of Covid-19 pandemic, the function was arranged in a very modest way, strictly as per the guidelines issued by Ministry of Home Affairs. The Independence Day was celebrated with minimum number of participants such as VCMC members, medical team, school team, CISF personnel, etc. and the duration of the programme was restricted to only 15 minutes. Live streaming of the programme was arranged through 'WEBEX' and 'YouTube' from 08:30 hrs onwards to reach out to the employees at large. Dr Biju Jacob, Chief Controller, VSSC, VCMC Members and other Senior Officials from Administrative area were also present. Shri S Somanath, Director, VSSC was ceremoniously welcomed and escorted by Commandant, CISF. Director hoisted the National Flag at 09:15 hrs and received the salute from the CISF contingent followed by collective singing of National Anthem. After the flag hoisting, Director, VSSC addressed the gathering and extended Independence Day greetings to all those who had gathered to grace the occasion and those watching the programme live. The parade dispersed at 09:30 hrs. A Patriotic song was sung by Students of VSSC Central School followed by the display of 'Onanu nammal' a musical tribute to Covid-19 warriors composed by VSSC Central School team.



▶ Director, VSSC hoisting the national flag

Excerpts of Director, VSSC's address.

Dear Friends, Welcome to the 74th Independence Day celebrations. Good morning to all of you who have gathered here and those who are watching this through video streaming platforms and social media. On this day, let us salute our fore fathers and remember all those who have sacrificed their lives for attaining independence for us, to enjoy the freedom in our lives. We will dedicate to work hard to preserve and enjoy the freedom bestowed on us.


Today, we are celebrating the Independence Day in a slightly different way due to the pandemic

which is creating havoc all around. Let us all – the 130 crore Indians join together to fight this pandemic out. We notice that there is a lot of disillusionment due to this. Industries are affected, lot of people are suffering, displaced and are struggling to survive. Let our hearts be with them.

We should be grateful that employees of our organisation and all central government employees are taken care; salaries are being paid, we are allowed to work from home, our medical needs are taken care. So we should redouble our efforts to serve our nation remembering the care that is extended by the government. Sure, we will come back to normalcy.

While we enjoy the care and protection, we should remember that our brothers are suffering. I am thankful to my colleagues who have and still are contributing to schemes like PM CARES and CMDRF. We could do very successful collections. We have to continue to support as more help may be required.

In VSSC we have been working. It is really wonderful that we realised three launch vehicles in January which went to launch pad. GLSV and PSLV were ready to be launched. But then they were held up pending approvals and then the pandemic struck. Let me congratulate teams who worked despite challenges, those who have travelled to SDSC SHAR,



disassembled the vehicle and took the stages to safety. We will continue our efforts to launch PSLV in the coming month; now that we have got clearance to go ahead with launches of C49 and 50. We have to find ways to proceed with launch preparations.

The best thing was when we found that launches are not happening, we focussed on TDPs and R&D, and in new projects like SSLV and RLV. Progress of work in these areas is very effective and satisfactory. RLV landing experiment was about to happen when the pandemic struck. The moment the facilities are open we can go ahead and do the RLV experiment. Similarly SSLV is also progressing well. I am happy to note that first launch is possible before this year end. Even in the current scenario teams across the launch vehicle centre is working to fructify their ambitions in different programs.

This progress of work is due to the support of a lot of people. I want to thank especially the Administration for information dissemination/ logistics, Medical for their timely advices and support, Purchase and Accounts – consignments are reaching and payments are being made, Transport – ensuring our mobility is not affected, Fire & safety – sanitising designated areas and even watering plants when everyone was prohibited to enter the campus, CMG – seeing

that projects are progressing even with the exodus of workers, Computer and network security – enabling smooth work from home methodologies, I congratulate all for the contributions and dedication which are to continue. Special salute to CISF team. They were here protecting our facilities when we were at home confined due to restrictions.

We should note that Education system of our country is badly affected. Schools are not opening and classes are not happening. In our school we have implemented virtual class room mode, equipments are purchased and installed. HRDD training is also planned in virtual mode.

We should not forget the activity being pursued in right earnest, the R&D which is one of the key aspects. We need to rekindle R&D activities. I was happy sitting through almost every day to review an array of R&D efforts presented by the different entities. I am sure the R&D efforts will change the way we are working.

About the restructuring that is being proposed, we should understand it is only to increase and enhance the Space infrastructure. Approach of the government is only to enhance the spread of Space activity substantially. ISRO

will continue to remain as a very inspiring and active R&D organisation that it has been for the last so many decades.

On this 74th Independence Day, let me salute one and all who have participated in building our organisation to this level and also all the country men who have been working to make India strong, vibrant, and democratic and techno savvy country. The mandate to us, the Vikram Sarabhai Space Centre and Indian space Research Organisation is to support our country in areas of key technologies. Only through the assimilation of high end technologies can the country remain strong and growth oriented. Let us do our part for this.

I once again salute each one of you, who are assembled here and those who have watched the celebrations and flag hoisting. Wish you a happy Independence Day.

**Jai Hind. Vande
Mataram.**



Superannuation

Following colleagues bade goodbye on superannuation on August 31, 2020.



N Devarajan Pillai

TSD

Joined on 05.02.1986



T Ferdinand

CSMD

Joined on 11.08.1986



Rajeevanayan Chitnis

LHFA

Joined on 16.08.1988



B Agnes

PGA

Joined on 10.04.1992

While appreciating their valuable service rendered to the Centre, **Countdown** wishes them happy, purposeful and prosperous retired life.

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Editorial support

Smt S Nisha

Photography support

CPF, TDAD, VSSC

Design and Layout

TDAD, VSSC

Published by

Technical Documentation and
Archival Division
Vikram Sarabhai Space Centre
Thiruvananthapuram 695 022

Countdown

The House Journal of Vikram Sarabhai Space Centre

August 2020 | Vol 41 | Issue No. 484



Cover Photo : Dr Suresh Chandra Gupta



Suggestions /feedback

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